SOME ALTERNATIVE COOPERATIVE ARRANGEMENTS FOR DISPERSED STATISTICAL PROGRAMS ON THE SAME UNIVERSITY CAMPUS

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1. Introduction

The listings of statistical programs at colleges and universities in the United States, as given in the current issue of the Mathematical Sciences, Administrative Directory - 1979, reveal an astonishing diversity of emphasis (as implied by title) and administrative arrangements. It appears that there are 50 separate departments of statistics in as many different universities and colleges and 61 separate departments of mathematical sciences (usually mathematics, statistics and computer science). In addition, this Directory lists 34 separate statistical programs, with two or more in each of a few universities, of a specialized and/or applied nature including: 16 departments of biostatistics, 4 applied statistics programs, 1 committee on statistics, 3 departments of biometry, 1 department of economics and statistics, 1 department of research and statistical methodology, 4 departments of statistics and biometry, 2 departments of experimental statistics, 1 department of business statistics and data processing, and 1 economics and social statistics department. The listing also includes a large number of other departments that do not have the word statistics in their titles but undoubtedly offer some courses in statistics and/or courses of a statistical nature; for example, departments of operation research and of course many of those in the complete list of mathematics departments.

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The lack of uniformity of emphasis and administrative arrangements of statistical programs, as noted above, is due of course to the many differences among the universities and colleges.

In two separate papers, prepared by request, the author has discussed the role of a complete statistical center in a large university (1973) and opportunities for extending the usual statistical program in departments of mathematical sciences in universities (1979). In this paper we shall be concerned with some alternative cooperative arrangements for dispersed statistical programs on the same university campus.

2. The Dual Nature of Statistics

Quoting from the (1979) paper, referred to above: "In addition to being one of mathematical sciences of interest as an intellectual pursuit in its own right, modern statistics provides an investigative methodology for obtaining new knowledge in a number of substantive disciplines. In this latter function then statistics is an important part of scientific method for such disciplines as: the biological sciences including medicine and agriculture; the behavioral and social sciences including economics and business, psychology, sociology, education, and political science; the physical sciences and engineering; and even the humanities to some degree."

3. The Early Emergence of Dispersed Statistical Programs on the Same University Campus

Due to the dual nature of statistics large universities, in particular those with many differing academic programs, experienced about 50 years ago the development of several statistical programs including a program in mathematical statistics, usually starting as a special field in the mathematics department. Concurrently, applied and specialized statistical programs began developing as

sub-units within certain substantive departments with extensive research and graduate programs.

The programs in mathematical statistics within mathematics departments were primarily concerned, of course, with the teaching of courses in theoretical statistics, requiring certain advanced courses in mathematics as prerequisites. Research investigations, again as would be expected, were concerned with the development of general theory. On the other hand, even if felt desirable, it was not feasible for the applied and specialized statistical methods courses, taught as part of scientific methodology usually within the various substantive departments, to require more than undergraduate mathematics and often only traditional 'college algebra' as prerequisite. The courses taught usually involved the use of statistical methods based on well known, and sometimes obsolete, statistical theory to analyze and draw inferences from collected data. Often the method of collection and/or generation of the data was not taken into account in the analysis and subsequent inferences.

In view of the differences in the interpretation of the nature of statistics, that is, as a mathematical science versus as a part of scientific methodology, resulting in different objectives and use of mathematical terminology and methods, the applied and specialized statistical programs in the respective substantive departments had little interaction among themselves or with the program in mathematical statistics in the mathematics department.

4. Possible Beneficial Results from Cooperative Arrangements for Dispersed Statistical Programs on the Same University Campus

Should it be acceptable to the faculty members and departments concerned and meet with the approval and support of the university administration, then it would be expected that some form of a cooperative arrangement for dispersed statistical programs on the same university campus would result in a number of benefits. In

particular these would include the following:

(i) The faculty in applied and specialized statistical programs in substantive disciplines, because of a closer association, would have more opportunities for consulting with the mathematical statisticians on any questions regarding the comparative theoretical soundness of alternative statistical methods available for the analysis of data and subsequent inferences. In addition, more opportunities for interacting with the mathematical statisticians should enable the applied statisticians to update, on a continuing basis, the statistical methods courses in the light of recent advances in pertinent statistical theory.

(ii) The faculty in the mathematical statistics program, as a result of the closer association and interaction with the applied statisticians, should have more opportunities of becoming aware of important unsolved research problems in mathematical statistics whose solution would lead directly to improved or new statistical methods of use to some or all applied statisticians. Work on such problems might be undertaken by a mathematical statistician working alone or in some cases more effectively undertaken as a joint research project with an applied statistician. In the latter case, any resulting publication would be expected to be jointly authored.

(iii) Should (i) and (ii) above eventuate as suggested, then it would be expected that the overall teaching and research program of the university would be improved as regards the quality of many quantitative studies and investigations. As a consequence it should be possible to develop well-rounded undergraduate and

graduate programs including applied as well as theoretical courses, for majors in statistics and as service courses for other departments. In addition, it should be possible to develop some joint major programs as between statistics and certain substantive disciplines that make use of statistics as an important research tool.

5. Office Space for Faculty and Supporting Staff for Alternative Cooperative Arrangements for Dispersed Statistical Programs on the Same University Campus

Any arrangement for office space would be contingent, of course, on the particular choice of a cooperative arrangement. Such a choice might be minimal, involving a confederation of the existing dispersed statistical programs with the cooperative activities guided by a university committee on statistics, with members representing the respective dispersed statistical programs in some equitable manner. In this case, it would be expected that the respective faculty and supporting staff would be officed, at least in the beginning, full time with the particular university department with the relevant statistical program. However, hopefully a suitable meeting room could be found to seat all faculty and students of the cooperative program at regularly scheduled seminars and other general meetings.

In the above connection, in order that proper information of the total strength of the university in statistics be readily available in one place for possible internal and external use, a combined role of all faculty members, both in theoretical and applied statistics, should be listed together in the relevant university catalogues. Such a listing should also be accompanied by other pertinent information such as: undergraduate and graduate degree program offerings in statistics, statistical service course offerings, on-campus statistical

consulting and cooperative research services, any on-campus statistical numerical analysis and data processing services, locations of relevant faculty or staff members to contact, etc.

At the other extreme, the choice of a cooperative arrangement might call for the establishing of a single complete statistical center comprising: (i) a department of statistics offering B.S., M.S., and Ph.D. degree programs in statistics per se (including theoretical and applied courses) with possible joint major degree programs as between statistics and various interested substantive departments, as well as undergraduate and graduate service courses in statistical methods and theory, and specialized courses primarily for students in substantive disciplines that use statistics as a primary research tool; (ii) a statistical laboratory or institute, established to provide an on-campus statistical consulting and cooperative research service, and an on-campus statistical numerical analysis and data processing service.

It is obvious that the complete statistical center would require housing in one location for the faculty, supporting staff, and supported students who have assignments in the department of statistics and the statistical laboratory or institute. In order that the complementary functions of the department and laboratory or institute be properly coordinated, it would seem advisable for the director of the laboratory or institute also serve as head of the department. Also, since the work involved in teaching statistical service courses and in on-campus statistical consulting and cooperative research are logically complementary in nature, it would seem desirable that certain qualified faculty members be assigned part-time duties in each area.

In the above connection, faculty members with part-time assignments in both the teaching of service courses and in on-campus consulting and cooperative research should obtain satisfaction in working on a one-to-one basis with graduate

student committees and cooperating in directing joint graduate degree programs.

Other choices of a cooperative arrangement might call for some intermediate degree as between a confederation and a complete statistical center as described above. In this connection, whatever the choice of cooperative arrangement, the author is strongly of the opinion that no previously established mathematical or applied statistician should be forced to join any proposed cooperative arrangement. On the other hand, objections on the part of a minority of those involved to joining a cooperative arrangement, acceptable to a majority of those involved, should not prevent its realization.

Should a sizeable number of both mathematical and applied statisticians, say a majority of those on a campus, approve some particular cooperative arrangement, then it is most important that the university administration give serious consideration to the feasibility of approval. If university approval is granted, then suitable housing should be provided with adequate adjoining offices to enable the faculty and supported staff and students to be physically together in one location either on a full time or, in the case of certain applied statisticians, part-time basis.

In the author's opinion, it would be most helpful if any independent housing, provided for any level of a cooperative arrangement, be centrally located on campus and preferably close to the university computation center and not too far from the major substantive departments requiring statistical services. In this connection, if possible, the faculty members who assume responsibility for on-campus statistical consulting and cooperative research should be officed on the first floor in order that they be easily accessible to consultees.

6. Statistical Programs for the Three Levels of Cooperative Arrangement

Even if the choice of a level of a cooperative arrangement should be a confederation of existing statistical programs within separate university departments, attention should be given by the suggested university committee on statistics to continuing or establishing well-rounded undergraduate and graduate degree programs in statistics per se, which should require certain basic courses in both mathematical and applied statistics. If in line with university policy, in the author's opinion, it would be desirable for graduate major programs in statistics to include a minor in some substantive discipline as a field of application. The feasibility of joint degree programs as between statistics and certain substantive disciplines should also be considered.

In addition to a teaching program for training undergraduate and graduate majors in statistics per se, the university committee on statistics should coordinate existing statistical service courses for substantive disciplines and establish new ones where needed. Again, as suggested earlier, the teachers of such service courses should be interested and qualified to provide an on-campus statistical consulting and cooperative research service.

It is realized, of course, that the above suggestions may be difficult to follow and will probably take some time to implement, if the choice of the level of a cooperative arrangement is a confederation. Even so, it is the author's opinion that a start should be made and the development should be evolutionary rather than revolutionary in nature.

Should the choice of a cooperative arrangement be at the other extreme, that is, a complete statistical center, then, of course, the implementation of the programs, described above and recommended as a final goal for a confederation cooperative arrangement of existing dispersed statistical programs, should be possible in the beginning.

Again, should the choice of a cooperative arrangement be of an intermediate level, as described earlier, then the timing of the evolution towards the realization of the same final goal would be expected to be faster than that of a confederation type of cooperation.

7. The Role of the 'Home' Departments of the Dispersed Statistical Programs as Regards the Respective Levels of Cooperation

Should the choice of level of cooperative arrangement be a confederation, the faculty members in the respective statistical programs should be offered faculty status in the overall coordinated university program, while continuing as faculty members in their respective 'home' departments. It is suggested that as the several programs of the coordinated university statistical program expand, then it would seem logical for the university administration to provide some funds for joint appointments, involving part-time salaries, as between the university cooperating statistical program or statistical center and the respective 'home' departments.

In the above connection, a shared budgetary arrangement suggested above for certain faculty members; in particular, for those responsible for the teaching of service courses, on-campus statistical consulting and cooperative research, would encourage communication and make possible desirable interaction between the 'home' department and the university cooperative statistical program or statistical center as regards the supervision of these important activities.

Joint appointments as between the cooperative statistical program or statistical center and the computation center, involving statistical computing faculty members, and the mathematics department, involving probabilists interested in the foundations of statistics, could also prove mutually beneficial. In particular, faculty members on such respective joint appointments should be interested in pursuing research respectively in statistical numerical analysis and the foundations

of statistical inference and the direction of graduate student theses in these respective areas.

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